

# Notice of Allowability

Application No.

10/720,042

Examiner

Said Broome

Applicant(s)

STROM ET AL.

Art Unit

2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 2/14/07.
2. ☒ The allowed claim(s) is/are 1,3,5-15,17,19-23,25-27,31-34 and 37-41.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

## DETAILED ACTION

### *Examiner's Amendment*

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Steve Smith on May 9, 2007.

Amend the claims as follows:

Cancel claims 22, 35 and 36.

Claim 1: In line 13 after the word "flags" delete the phrase "before processing" and insert the phrase "and then returning to the first tile to process".

Claim 41: In line 2 delete the word "plurality" and insert the word "row". Then, continuing in line 2, after the word "tiles," delete the phrase "each tile comprising a plurality" and insert the phrase "the row of tiles including at least two rows". In line 5 delete the phrase "pixels in". In line 8 insert the phrase "establishing a tile occlusion information cache configured to store respective occlusion flags for respective tiles of a row of tiles and respective minimum depth values for the respective tiles of the row of tiles;" then indent on the next line, which is now line 11, and insert the phrase "comparing the maximum depth value for the graphic primitive to the minimum depth value for the given tile stored in the tile occlusion information cache;". In line 16, before the phrase "processing a pixel within..." insert the phrase "processing pixels for the graphics primitive in a row-by-row fashion, said processing step including".

*Allowable Subject Matter*

Claims 1, 3, 5-15, 17, 19-23, 25-27, 31-34 and 37-41 are allowed. The following is an examiner's statement of reasons for allowance:

The prior art references, Xie et al.(hereinafter "Xie", US Patent 6,525,726) and Larson (US Patent 6,313,839) do not teach all the limitations of claims 1, 3, 5-15, 17, 19-23, 25-27, 31-34 and 37-41.

Regarding claim 1, Xie teaches defining a plurality of rows of tiles in a graphics display field comprising a plurality of rows of pixels, each tile including pixels from at least two rows of pixels in column 4 lines 43-46. Xie also teaches processing a portion of pixels in a first tile of the row of tiles responsive to the occlusion flags and depending on the geometry of the primitive, processing pixels in a second tile of the row of tiles in column 8 lines 58-67, where it is described that once a first tile is processed, a second subsequent tile may be then processed. Xie also teaches utilizing results of the graphics processing to display enhanced graphics on an electronic display in column 5 lines 4-8. Larson teaches storing respective occlusion threshold depth values for the respective tiles, or regions, of the row of tiles or regions in column 5 lines 33-35 and in column 6 lines 23-25, where it is described that the determination of visibility is performed for the tile of pixels. However, the prior fails to teach or suggest setting occlusion flags for respective tiles of a row of tiles for a graphics primitive based on whether respective representative depth values for the tiles of the row of tiles meet an occlusion criterion, processing pixels in rows of pixels corresponding to the row of tiles for the graphics primitive in a row-by-row manner responsive to the occlusion flags, wherein the step of processing pixels includes: processing a portion of the pixels in a first tile of the row of tiles responsive to the occlusion

flags; and depending on the geometry of the primitive, processing pixels in a second tile of the row of tiles responsive to the occlusion flags and then returning to the first tile to process additional pixels in the first tile responsive to the occlusion flags; wherein the occlusion flags are stored in a tile occlusion information cache that is configured to store respective occlusion flags for respective tiles of a row of tiles and respective occlusion threshold depth values for the respective tiles of the row of tiles, and wherein the step of setting occlusion flags includes: determining a maximum depth value for the graphics primitive within a tile; comparing the maximum depth value to the cached occlusion threshold depth value for the tile in the tile occlusion information cache; and setting the occlusion flag for the tile responsive to the comparison. Therefore claims 1, 3, 5-8, 15, 17, 19, 23 and 25 are allowable.

Regarding claim 9, Xie teaches defining a plurality of rows of tiles in a graphics display field comprising a plurality of rows of pixels, each tile including pixels from at least two rows of pixels in column 4 lines 43-46. Xie also teaches establishing a depth buffer configured to store respective occlusion threshold depth values for respective pixels of the graphics display field in column 2 lines 29-32. Xie teaches performing a test on each tile to determine occlusion in column 5 lines 22-24, therefore an indication of the result of the occlusion test is performed with respect to the illustrated steps 50-62 of Figure 2. Xie also teaches utilizing results of the graphics processing to display enhanced graphics on an electronic display in column 5 lines 4-8. Larson teaches storing respective occlusion threshold depth values for the respective tiles, or regions, of the row of tiles or regions in column 5 lines 33-35 and in column 6 lines 23-25, where it is described that the determination of visibility is performed for the tile of pixels. However the prior art fails to teach or suggest setting occlusion flags for respective tiles of a row of tiles for a

graphics primitive based on whether respective representative depth values for the tiles of the row of tiles meet an occlusion criterion; processing pixels in rows of pixels corresponding to the row of tiles for the graphics primitive in a row-by-row manner responsive to the occlusion flags; wherein setting occlusion flags comprises setting the occlusion flag for a tile to indicate possible occlusion; and wherein processing pixels comprises: detecting that the tile has an occlusion flag indicating possible occlusion; and comparing the depth value for the graphics primitive for a pixel in the tile to an occlusion threshold depth value for the pixel in the depth buffer responsive to detecting that the tile has an occlusion flag indicating possible occlusion; processing the pixel responsive to the comparison; and updating the occlusion threshold depth value for the tile in the tile occlusion information cache responsive to the written z-value of the pixel. Therefore claims 9 and 10 are allowable.

Regarding claim 11, Xie teaches defining rows of tiles in a graphics display field comprising a plurality of rows of pixels in column 4 lines 43-46 and determining occlusion for a row of tiles in step 50 of Figure 2. Xie also teaches utilizing results of the graphics processing to display enhanced graphics on an electronic display in column 5 lines 4-8. Larson teaches storing respective occlusion threshold depth values for the respective tiles, or regions, of the row of tiles or regions in column 5 lines 33-35 and in column 6 lines 23-25, where it is described that the determination of visibility is performed for the region of pixels. However, Xie and Larson do not teach or suggest setting occlusion flags for respective tiles of a row of tiles for a graphics primitive based on whether respective representative depth values for the tiles of the row of tiles meet an occlusion criterion, wherein the occlusion flags are stored in a tile occlusion information cache that is configured to store respective occlusion flags for respective tiles of a row of tiles,

respective occlusion threshold depth values for the respective tiles of the row of tiles, and respective status flags for respective tiles of the row of tiles; processing pixels in rows of pixels corresponding to the row of tiles for the graphics primitive in a row-by-row manner responsive to the occlusion flags, said processing step including: processing a first row of pixels responsive to the tile occlusion information cache, wherein processing a first row of pixels comprises setting occlusion and status flags for at least one tile in the first row of tiles to indicate that occlusion status of the at least one tile has been determined; determining whether a second row of pixels is in the first row of tiles; and processing a second row of pixels using information in the tile occlusion cache gained from the first row of pixels if the second row of pixels is in the first row of tiles. Therefore claim 11 is allowable.

Regarding claims 12 and 13, Xie teaches defining rows of tiles in a graphics display field comprising a plurality of rows of pixels in column 4 lines 43-46 and determining occlusion for a row of tiles in step 50 of Figure 2. Larson teaches storing respective occlusion threshold depth values for the respective tiles, or regions, of the row of tiles or regions in column 5 lines 33-35 and in column 6 lines 23-25, where it is described that the determination of visibility is performed for the region of pixels. However, Xie and Larson do not teach or suggest setting the occlusion and status flags in the tile occlusion information cache to predetermined values and storing occlusion threshold depth values for the first row of tiles from the aggregate tile occlusion information memory in the tile occlusion information cache, as recited in claim 12; and the references also do not teach or suggest that responsive to determining whether the second row of pixels is in a second row of tiles writing back the occlusion threshold depth values from the tile occlusion information cache to the aggregate tile occlusion information in the tile

occlusion information cache, loading occlusion threshold depth values into the tile occlusion information cache with corresponding occlusion threshold depth values for the second row of tiles from the aggregate tile occlusion information memory, and processing the second row of pixels using the updated tile occlusion cache, as recited in claim 13. Therefore claims 12-14 are allowable.

Regarding claim 41, Xie teaches defining a plurality of rows of tiles in a graphics display field comprising a plurality of rows of pixels, each tile including pixels from at least two rows of pixels in column 4 lines 43-46. Xie also teaches processing a portion of pixels in a first tile of the row of tiles responsive to the occlusion flags and depending on the geometry of the primitive, processing pixels in a second tile of the row of tiles in column 8 lines 58-67, where it is described that once a first tile is processed, a second subsequent tile may be then processed. Xie also teaches utilizing results of the graphics processing to display enhanced graphics on an electronic display in column 5 lines 4-8. Larson teaches storing respective occlusion threshold depth values for the respective tiles, or regions, of the row of tiles or regions in column 5 lines 33-35 and in column 6 lines 23-25, where it is described that the determination of visibility is performed for the tile of pixels. However, the prior fails to teach or suggest establishing a tile occlusion information cache configured to store respective occlusion flags for respective tiles of a row of tiles and respective minimum depth values for the respective tiles of the row of tiles; comparing the maximum depth value for the graphic primitive to the minimum depth value for the given tile stored in the tile occlusion information cache; setting an occlusion flag for the given tile to indicate that the graphics primitive is not occluded in the given tile upon determining that the minimum depth value for the given tile exceeds the maximum depth value

for the graphics primitive; processing pixels for the graphics primitive in a row-by-row fashion, said processing step including processing a pixel within the given tile for the graphics primitive responsive to the setting of the occlusion flag; and utilizing results of the graphics processing to display enhanced graphics on an electronic display. Therefore claims 20, 26, 31-34 and 37-41 are allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent publication is cited to further show the state of the art with respect to processing tiles or regions of pixels:

- Abdallah US 2002/0118189

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached on M-F 8:30am-5pm.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

*/Said Broome/*

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5/11/07



Ulka Chauhan

Supervisory Patent Examiner